Protocol: Wolf

Parks Where Protocol Will Be Implemented: ALAG, ANIA, KATM, LACL

Justification/Issues Being Addressed: Wolves (*Canis lupus*) are top predators in terrestrial systems within SWAN parks and hence can significantly influence population dynamics of their ungulate prey species (Miller et al. 2001). They also can indirectly affect structure, composition, and parkwide patterns of vegetation communities through their influence on ungulate abundance and distribution. Further, because of its cascading effects through various trophic levels, wolf predation is a key component of biodiversity (Ripple and Beschta 2004). Recent declines and shifts in spatial distribution of the Mulchatna Caribou Herd (Woolington and McDonald 2003) could potentially have a detrimental effect on wolf abundance and distribution in LACL and KATM, especially if this herd shifts to outside park boundaries, where wolves are subject to aerial hunting and other forms of harvest.

Wolves are found over most of SWAN at densities that are correlated with variations in ungulate biomass, and they are known to readily colonize new habitats as prey become available. In Alaska, conflicts among people with different interests in wolves are intense. Wolves can be a major predator of moose and caribou in national parks and preserves. Subsistence and sport hunters desire fewer wolves because they compete for game resources, whereas nonconsumptive park users desire wolves for viewing and photography. Because of these challenges, park managers need long-term data on wolf numbers, wolf prey, and natural processes such as vegetation succession that influence their populations.

Specific Monitoring Questions and Objectives to be Addressed by the Protocol:

Question:

- What are the trends in wolf populations within SWAN parks?

Objective:

- Estimate long-term trends in abundance and distribution of wolves from randomly sampled areas in SWAN parks.

Basic Approach: The sample unit probability estimator (SUPE; Becker et al. 1998) design will be used to estimate abundance of wolves in SWAN parks. SUPE is a stratified network (or snowball) sampling design based on aerially detecting and following fresh animal tracks in the snow from beginning to end. The length of a track is used to calculate its encounter probability during the survey, which then is used in a Horvitz-Thompson estimator (Horvitz and Thompson 1952) to estimate abundance. The assumptions of this design are: (i) all wolves move during the period of interest; (ii) wolf tracks are easily identifiable from a slow, low-flying aircraft; (iii) tracks are continuous; (iv) track lengths (movements) are not influenced by the survey aircraft; (v) fresh wolf tracks can be distinguished from old tracks; (vi) all fresh wolf tracks are detected within searched units; (vii) fresh tracks can be followed from beginning to end; and (viii) pack size of detected wolves is correctly recorded (Becker et al. 1998).

Each park is divided into 3.9-15.8 mi^2 (10-41 km^2) rectangular or square quadrats (sampling units) that are assigned to one of three strata. Strata represent areas of low, medium, and high perceived probability of detecting wolf tracks based on previous experience. Sampling units are randomly chosen to be surveyed within each stratum based on the approximate percentages of 65, 40, and 20 for high, medium, and low strata, respectively, which will focus survey effort in those strata where tracks have the highest probability of detection. Each selected unit is aerially surveyed for wolf tracks by a pilot and experienced observer in a Super Cub within 24–48 hr after snowfall (2–3.9 in [5–10 cm]) or after strong winds have subsided after a snowfall. Detected tracks are followed until wolves or their dens are located (Becker et al. 1998, Becker et al. 2004). Results of abundance surveys also will provide an estimate of spatial distribution.

Principal Investigators and NPS Lead:

- Howard Golden, ADF&G
- Lem Butler, ADF&G
- Jim Woolington, ADF&G
- Judy Putera, NPS-LACL
- Bill Thompson, NPS-SWAN (NPS Lead)

Development Schedule, Budget, and Expected Interim Products: ADF&G has a well-established protocol for surveying wolves that has been successfully implemented in 11 locations across Alaska (Becker et al. 2004).

2008 Draft SOPs ($ to be determined).

2009 Test protocols ($ to be determined).

2010 Implement protocol ($ to be determined).

Literature Cited:

Becker, E. F., H. N. Golden, and C. L. Gardner. 2004. Using probability sampling of animal tracks in snow to estimate population size. Pages 248–270 *in* W. L. Thompson, editor. Sampling rare or elusive species: Concepts, designs, and techniques for estimating population parameters. Island Press, Washington, D.C.

Becker, E. F., M. A. Spindler, and T. O. Osborne. 1998. A population estimator based on network sampling of tracks in the snow. Journal of Wildlife Management **62:**968–977.

Horvitz, D. G., and D. J. Thompson. 1952. A generalization of sampling without replacement from a finite universe. Journal of the American Statistical Association **47**:663-685.

Miller, B., B. Dugelby, D. Foreman, C. Martinez del Rio, R. Noss, M. Phillips, R. Reading, M. E. Soule, J. Terbourgh, and L. Willcox. 2001. The importance of large carnivores to healthy ecosystems. Endangered Species Update **18**:202-210.

Ripple, W. J., and R. L. Beschta. 2004. Wolves and the ecology of fear: Can predation risk structure ecosystems? Bioscience **54**:755-766.

Woolington, J. D., and M. G. McDonald. 2003. Caribou management report: Mulchatna herd. Pages 34-52 *in* C. Healy, editor. Caribou management report of survey-inventory activities, 1 July 2000-30 June 2002. Alaska Department of Fish and Game, Juneau. Online. (http://www.wildlife.alaska.gov/pubs/techpubs/mgt_rpts/ca03mt-sc-int.pdf). Accessed 26 July 2005.